MODIFICATION OF THE CUTANEOUS INFLAMMATORY REACTION IN GUINEA PIGS BY SPLENIN

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Experiments on guinea pigs showed that intraperitoneal injection of splenin inhibits the development of the local inflammatory reaction to lincomycin.

KEY WORDS: lincomycin; cutaneous inflammatory reaction; splenin.

There is evidence to show that individual forms of protein-free extracts of the spleen reduce capillary permeability and inhibit the inflammatory process [5]. Confirmation of this view was obtained by Coburn et al. [4] in experiments on animals with acute inflammation. These workers found that substances formed in the spleen, like certain hormones (cortisone and hydrocortisone), have an antiinflammatory action. Other workers showed that after splenectomy in man, when antibody production is depressed and repair processes inhibited, the injection of splenin has a regulatory and normalizing effect [6]. However, there is no information in the literature on the effect of splenin on the local cutaneous inflammatory reaction.

In this investigation the effect of splenin on the course of local aseptic inflammation was studied and the character and severity of the cytological changes in the inflammatory focus were determined.

EXPERIMENTAL METHOD

Experiments were carried out on 16 white guinea pigs weighing 200-220 g. Aseptic inflammation of the skin was produced in all the animals by intradermal injection of 25 mg of the antibiotic lincomycin hydrochloride monohydrate, with an activity of 100,000 units/mg, which was injected in 0.1 ml physiological saline. Lincomycin is known to cause a local cytotoxic reaction in man. For this reason, patients are treated with lincomycin with a minimal local irritant action [1]. In the present experiments lincomycin was injected intradermally into all the animals into lateral regions of the body, with two injections given on each side. Altogether 64 skin reactions were studied.

Depending on the experimental conditions the animals were subdivided into two series, with eight guinea pigs in each series. Four guinea pigs in each series were control and the other four experimental animals. Besides receiving lincomycin, all the experimental animals were given an intraperitoneal injection of 1 ml splenin.

Protein-free splenin manufactured by the Darnitskii Pharmaceutical Chemical Factory (Kiev), by the process suggested by Komissarenko [2] was used in the experiments. The area of skin necrosis in the control and experimental animals was measured 24 and 48 h later. Only obvious areas of inflammation with a clearly outlined zone of necrosis, gray or blue-black in color, were taken into account. After summation of the results the arithmetic mean size of the inflammatory area was calculated.

The percentage decrease in area of the inflammatory reaction in the experimental animals compared with the controls was calculated. The results were subjected to statistical analysis [3].

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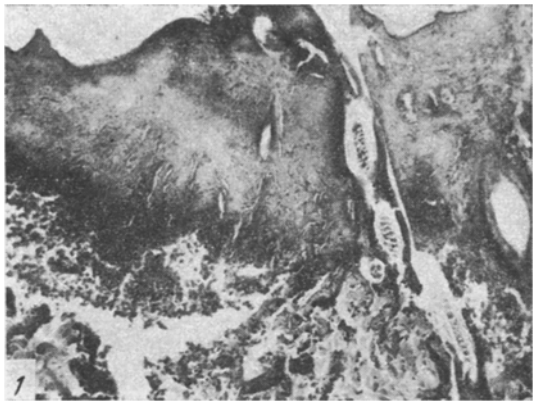

Fig. 1. Inflammatory focus in skin of a guinea pig after intradermal injection of lincomycin. Photomicrograph, 100 ×. Hematoxylin–eosin.

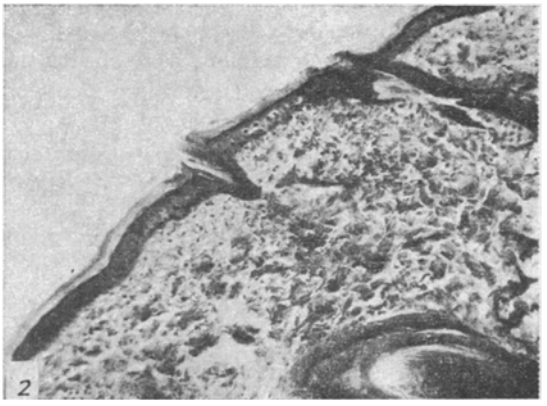

Fig. 2. Area of skin after intradermal injection of lincomycin and intraperitoneal injection of splenin. Photomicrograph, 100 ×. Hematoxylin–eosin.

To study morphological changes in the focus of inflammation the animals were killed (by a blow on the head) and the inflammatory areas of skin removed. Pieces of tissue were fixed in Carnoy's mixture and stained with hematoxylin-eosin.

EXPERIMENTAL RESULTS

The size of the inflammatory area in parallel series of experiments 24 h after injection of lincomycin averaged 6.5 ± 0.2–6.5 ± 0.02 mm. The inflammatory reaction was manifested as a clearly outlined zone of necrosis, gray or blue-black in color, in the center, and a zone of hyperemia and edema at the periphery. After 48 h the inflammatory focus had increased to its maximal size (10.0 ± 0.02–10.9 ± 0.01 mm).

In the experimental animals receiving splenin intraperitoneally the inflammatory reaction was inhibited. After 24 h in two parallel series of experiments it was considerably smaller in size (4.4 ± 0.4 and 4.6 ± 0.19 mm) than in the animals of the control group. After 48 h the cutaneous inflammatory process was stabilized, a scab formed, and there was a clearly outlined hyperemic area measuring 6.6 ± 0.07 to 7.0 ± 0.18 mm.

The inflammatory foci in the experimental guinea pigs were thus 35.8–39.5% smaller than in the controls. In some animals no inflammatory reaction could be detected after 48 h.

On histological examination of the area of skin in the control animals a marked inflammatory reaction was present, the zone of necrosis was separated by a leukocytic barrier from the underlying tissue, adjacent layers of the dermis were infiltrated by leukocytes, the blood vessels were dilated, and hemorrhages were observed (Fig. 1). Histological examination of the areas of skin in the experimental animals showed the absence of a clearly defined inflammatory reaction: at the site of injection of lincomycin the integrity of the epidermis was not disturbed, the structure of the dermal layer was intact, and only slight hyperemia was seen (Fig. 2).

Inhibition of the cutaneous inflammatory reaction by splenin was thus demonstrated in experiments on these animals. Splenin can be considered to contain substances with an anticytotoxic and anti-inflammatory action.

LITERATURE CITED

1. O. B. Ermolova, A. F. Zak, and L. M. Yakobson, Antibiotiki, No. 12, 1096 (1969).
2. V. P. Komissarenko, Vrach. Delo, No. 10, 1027 (1958).
3. I. A. Oivin, Pat. Fiziol., No. 4, 76 (1960).
4. A. F. Coburn and I. Haninger, J. Exp. Med., 99, 1 (1954).
5. G. Ungar, E. Damgaard, and H. G. Weinstein, Am. J. Physiol., 166, 340 (1951).
6. G. Ungar, J. Physiol. (Paris), 39, 219 (1947).